Statistics

PO 1. Disciplinary Knowledge: Demonstrate comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study .

PO 2. Social Interaction: express thoughts and ideas effectively in writing and orally; listen and communicate with others using appropriate media. Work effectively and respectfully with diverse teams; act together as a group or a team in the interests of a common cause; Elicit views of others, mediate disagreements and help reach conclusions in group settings .

PO 3. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and act with an informed awareness of issues and participate in civic life through volunteering; embrace moral/ ethical values in conducting one's life, possess knowledge of the values and beliefs of multiple cultures and a global perspectives; engage in a multicultural society and interact respectfully with diverse groups.

PO 4. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO 5. Information and Digital Literacy: Use ICT in a variety of learning situations; demonstrate ability to access, evaluate and use a variety of relevant information sources; and use appropriate software for analysis of data.

PO 6. Research –related skills: Critically evaluate practices, policies and theories by following scientific approach to knowledge development. Have a sense of inquiry and capability for asking relevant/ appropriate questions, problematizing, synthesizing and articulating; ability to recognize cause- and-effect relationships, define problems, formulate hypotheses, interpret and draw conclusions from data, ability to plan, execute and report the results of an experiment or investigation; ability to apply one's learning to real life situations.

PSO1.This course in statistics helps the students to develop, design and analyse experiments in empirical research.
PSO2.It helps in optimization and computational techniques for the solution of the real-life problems.
PSO3.Analyse complex statistical data coming from the various fields like industry, marketing, finance, agriculture and business.
PSO4.This program offers a range of traditional avenues in academics, Govt. Service, IAS, Indian Statistical/ Economic Services, Industries, Commerce, Investment Banking, Banks and Insurance Sectors, CSO and NSSO, Research Personnel/Investigator in Govt. organizations such as NCAER, IAMR, ICMR, Statistical and Economic Bureau & various PSUs., Market Research, Actuarial Sciences, Biostatistics, Demography etc.

COs (**STA-HC-1016**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on scope of statistics, qualitative and quantitative data, histogram, ogives,box plot, measure of central tendency, skewness and kurtosis.[**Understand**]
- Know about collection of data, sample survey, questionnaire, primary data and secondary data, correlation, regression.[**Remember]**
- Know about the scatter diagram, simple and multiple correlation, index number, construction of index number, types of index number, chain based index number.[**Understand]**

- Principles of least square, fitting of polynomials and exponential curve .[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HC-1016

	Unit	Unit	Unit	Unit	Unit	Unit	Unit

	I	II	III	IV	V	VI	VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on scope of statistics, qualitative and quantitative data, histogram, ogives,box plot, measure of central tendency, skewness and kurtosis.[**Understand**]
- Know about collection of data, sample survey, questionnaire, primary data and secondary data, correlation, regression.[**Remember]**
- Know about the scatter diagram, simple and multiple correlation, index number, construction of index number, types of index number, chain based index number.[**Understand]**

- Principles of least square, fitting of polynomials and exponential curve .[**Analyse]**

Unit I: statistical method
Unit II: measures of central tendency
Unit III: Bivariate Data
Unit IV: Index numbers

COs (**STA-HC-1026)** mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Understand mathematical calculus, Integral calculus, Differential equations . [**Remember, Understand, Apply, Analyze**]
- Analyse partial Differential equations through visualizations [**Remember, Understand, Apply, Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-1026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M	M	M			
CO 2	M	H	H	M			
CO 3	M	H	H	M			
CO 4	M	H	H	H			
CO 5							

Unit I: Differential Calculus.

Unit II:Integral Calculus.

Unit III:Differential Equations.

Unit IV: Partial Differential Equations.

After the completion of this course, the students will be able to :

- Understand mathematical calculus, Integral calculus, Differential equations . [**Remember, Understand, Apply, Analyze]**
- Analyse partial Differential equations through visualizations [**Remember, Understand, Apply, Analyse]**

COs (**STA-HG-1016)** mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on scope of statistics, qualitative and quantitative data, histogram, ogives,box plot, measure of central tendency, skewness and kurtosis, difference table, missing term.[**Understand**]
- Know about collection of data, sample survey, questionnaire, primary data and secondary data, correlation, regression.[**Remember]**
- Know about the scatter diagram, simple and multiple correlation, index number, construction of index number, types of index number, chain based index number, theory of attributes, independence and association of attributes, contingency table.[**Understand]**

- Derivation of Newtons Forward and Bcakward interpolation formula, lagranges formula, general quadrature formula, Trapezoidal Rule, Simpsons 1/3 rd rule, Simpsons 3/8 th rule, Newton Raphson method.[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HG-1016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on scope of statistics, qualitative and quantitative data, histogram, ogives,box plot, measure of central tendency, skewness and kurtosis.[**Understand**]
- Know about collection of data, sample survey, questionnaire, primary data and secondary data, correlation, regression.[**Remember]**
- Know about the scatter diagram, simple and multiple correlation, index number, construction of index number, types of index number, chain based index number.[**Understand]**

- Principles of least square, fitting of polynomials and exponential curve .[**Analyse]**

Unit I: statistical data
Unit II: measures of central tendency
Unit III: Calculus of finite difference
Unit IV: Bivariate Data
Unit V: Theory of Attributes

COs (**STA-HC-2016**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on Probability, random variables, types of r.v and properties of r.v.[**Understand**]
- Know about the distribution functions and properties of distribution function.[**Remember]**

- Know about the expectations and generating function like m.g.f, cumulant generating function, characteristic functions.[**Understand]**

- Have Knowledge on Binomial, Poisson and Normal distributions and its various properties.[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HC-2016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

Unit I: Probability.

Unit II:Random variables.

Unit III:Mathematical Expectation and Generating Functions.

UnitIV: Mathematical Expectation and Generating Functions

After the completion of this course, the students will be able to :

- Acquire knowledge on Probability, random variables, types of r.v and properties of r.v.[**Understand**]
- Know about the distribution functions and properties of distribution function.[**Remember]**
- Know about the expectations and generating function like m.g.f, cumulant generating function, characteristic functions.[**Understand]**

- Have Knowledge on Binomial, Poisson and Normal distributions and its various properties.[**Analyse]**

- Along with this students are equipped with skill enhancement courses like Research methodology, SPSS and R language etc.[**Apply,Analyse,Create**]

Unit I: Probability.
Unit II:Random variables.
Unit III:Mathematical Expectation and Generating Functions. UnitIV: Mathematical Expectation and Generating Functions

STA-HC-2026

After the completion of this course the students will be able to

- Gain knowledge on different types of equation like quadratic, cubic etc. [**Remember, Understand, Apply, Analyze]**
- Acquire a prior knowledge on matrix, different types of matrices, adjoint and inverse of a matrix, solution of set of linear equations through matrices, rank of a matrix, characteristic roots and characteristic vectors and their properties, quadratic forms.

[**Remember, Understand, Apply, Analyze**]

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-2026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII

Unit I: Theory of equations.

CO 1	**H**	**M**	**M**	**M**				Unit II: Algebra of matrices.
CO 2	**M**	**H**	**M**	**M**				Unit III:Determinants of Matrices.
CO 3	**H**	**H**	**H**	**M**				Unit IV: Matrices.
CO 4	**H**	**H**	**H**	**H**				
CO 5								

After the completion of this course the students will be able to

- gain knowledge on different types of equation like quadratic, cubic etc. [**Remember, Understand, Apply, Analyze]**
- Acquire a prior knowledge on matrix, different types of matrices, adjoint and inverse of a matrix, solution of set of linear equations through matrices, rank of a matrix, characteristic roots and characteristic vectors and their properties, quadratic forms.[**Understand, Apply, Analyze]**

[**Remember, Understand, Apply, Analyze]**

After the completion of this course the students will be able to:

- Know about different types of sets, series and sequence, real numbers, Principle of Convergence.[**Remember, Understand, Apply, Analyse**][
- Design a questionnaire.[**Analyse**]

COs (**STA-HG-2016**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge onProbability, random experiment, sample space, events, classical, axiomatic, statistical probability, p.m.f, p.d.f.[**Understand**]
- Know about laws of addition and multiplication, discrete and continuous random variables, properties of r.v, expectation, moment, variance.[**Remember]**
- Know about moment generating function, poission distribution, binomial distribution, geometric distribution, normal, beta ,gamma distribution.[**Understand]**

- Derivation ofBaye's theorem, chebyshev's inequality, WLLN, De- Moivers Laplace Theorem, Lindeberg Levy CLT..[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HG-2016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on Probability, random experiment, sample space, events, classical, axiomatic, statistical probability, p.m.f, p.d.f.[**Understand**]

- Know about laws of addition and multiplication, discrete and continuous random variables, properties of r.v, expectation, moment, variance.[**Remember]**
- Know about moment generating function, poission distribution, binomial distribution, geometric distribution, normal, beta ,gamma distribution.[**Understand]**

- Derivation of Baye's theorem, chebyshev's inequality, WLLN, De- Moivers Laplace Theorem, Lindeberg Levy CLT..[**Analyse]**

Unit I: Probability
Unit II:Random Variables
Unit III: Convergence in Probability
Unit IV: Standard Distribution

COs (**STA-HC-3016**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Understand the concept of sampling distribution, t distribution, F distribution, chi – square distribution and their properties and applications in real life. (Understand)
- Solve some practical Problems based on exact sampling distributions. (Evaluate)
- Acquire knowledge on Population, Sample, Parameter, Statistics, Large and small sample, Types of hypothesis and types of errors etc. (Remember)

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H

CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HC-3016

	Unit I	**Unit II**	**Unit III**	**Unit IV**	**Unit V**	**Unit VI**	**Unit VII**
CO 1			**H**	**M**			
CO 2			**H**	**L**			
CO 3			L	H			
CO 4							
CO 5							

After the completion of this course the students will be able to:

- Understand the concept of sampling distribution, t distribution, F distribution, chi – square distribution and their properties and applications in real life. (Understand)
- Solve some practical Problems based on exact sampling distributions. (Evaluate)
- Acquire knowledge on Population, Sample, Parameter, Statistics, Large and small sample, Types of hypothesis and types of errors etc. (Remember)

Unit I: Order Statistics
Unit II: Sampling Distribution
Unit III: Exact Sampling Distribution
Unit IV: Sampling Distribution

COs (**STA-HC-3026**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Understand Census, Sampling, Execution of sample surveys and error.[Understoo]
- Design a questionnaire.[understood]
- Know the function of CSo, NSSO, MoSPI etc.[Analuye]

- Use of simple random sampling with and without replacement, stratified random sampling, systematic sampling, cluster sampling etc[Evaluate]

- Acquire knowledge on Population, Sample, Parameter, Statistics, Large and small sample, Types of hypothesis and types of errors etc. (Remember)

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HC-3026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1			H	M			
CO 2			H	L			

CO 3			L	H			
CO 4			M	**H**			
CO 5			M	M			

After the completion of this course the students will be able to:

- Understand Census, Sampling, Execution of sample surveys and error.[Understood]
- Design a questionnaire.[Understood]
- Know the function of CSo, NSSO, MoSPI etc.[Analyse]

- Use of simple random sampling with and without replacement, stratified random sampling, systematic sampling, cluster sampling etc[Evaluate]

- Acquire knowledge on Population, Sample, Parameter, Statistics, Large and small sample, Types of hypothesis and types of errors etc. (Remember)

Unit I: Survey Sampling.
Unit II:Stratified Random Sampling.
Unit III: Ratio and Regression Method of Sampling. .

STA-HC-3036

- Know the function of CSo, NSSO, MoSPI etc. [**Remember, Understand, Apply, Analyse**]

- Use of simple random sampling with and without replacement, stratified random sampling, systematic sampling, cluster sampling etc[**Remember, Understand, Apply, Analyse]**

Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**

CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-3036

	Unit I	**Unit II**	**Unit III**	**Unit IV**	**Unit V**	**Unit VI**	**Unit VII**
CO 1	**H**	**M**	**M**	**M**			
CO 2	**M**	**H**	**M**	**M**			
CO 3	**H**	**H**	**H**	**M**			
CO 4	**H**	**H**	**H**	**H**			
CO 5							

Unit I: Real Analysis.

Unit II:Infinite Series.

Unit III: Limits, Continuity and Differentiability.

After the completion of this course the students will be able to:

- Know about different types of sets, series and sequence, real numbers, Principle of Convergence.[**Remember, Understand, Apply, Analyse**]
- Design a questionnaire.
- Know the function of CSo, NSSO, MoSPI etc. [**Remember, Understand, Apply, Analyse**]

- Use of simple random sampling with and without replacement, stratified random sampling, systematic sampling, cluster sampling etc[**Remember, Understand, Apply, Analyse]**
- COs (**SE-3014**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Acquire knowledge on entering data by using R programming, performing various graphical representation of collected data and analysis of data by using various R packages.[Remember,Understand,Analyse,Evaluate]

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

SE-3014

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1			**H**	**M**			
CO 2			**H**	**L**			
CO 3			L	H			
CO 4			M	**H**			
CO 5			M	M			

After the completion of this course the students will be able

- Acquire knowledge on entering data by using R programming, performing various graphical representation of collected data and analysis of data by using various R packages.[Remember,Understand,Analyse,Evaluate]

Unit I: Graphical Representation.
Unit II:Report Generation.
Unit III: Fitting Curves.

COs (**STA-HG-3016**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on estimation of population mean, null and alternative hypothesis, type I and type II error, p-values .[**Understand**]
- Know about sign test for symmetry, Wilcoxon two sample test, non parametric test.[**Remember]**
- Know about test of proportion, chi square goodness of fit, yate's correction table, Analysis of variance, principles of design of experiment, one way and two way ANOVA, treatmet, block.[**Understand]**
- Derivation on analysis of completely randomized design, randomized block design.[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HG-3016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on estimation of population mean, null and alternative hypothesis, type I and type II error, p-values .[**Understand**]
- Know about sign test for symmetry, Wilcoxon two sample test, non parametric test.[**Remember]**
- Know about test of proportion, chi square goodness of fit, yate's correction table, Analysis of variance, principles of design of experiment, one way and two way ANOVA, treatmet, block.[**Understand]**
- Derivation on analysis of completely randomized design, randomized block design.[**Analyse]**

Unit I: Test of Hypothesis
Unit II:Categorical data analysis
Unit III: Analysis of variance

- **STA-HC-4016**

After the completion of this course the students will be able to:

- Understand Estimation, various methods of Estimation[**Remember, Understand, Apply, Analyse]**
- Test of Significance and SPRT.[**Remember, Understand, Apply, Analyse**]

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4

Mapping										
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-4016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M	M	M			
CO 2	M	H	M	M			
CO 3	H	H	H	M			
CO 4	H	H	H	H			
CO 5							

Unit I: Estimation

Unit II Methods of Estimation.

Unit III:Principles of test of significance

Unit IV: Principles of test of significance

After the completion of this course the students will be able to:

- Understand Estimation, various methods of Estimation[**Remember, Understand, Apply, Analyse]**
- Test of Significance and SPRT.[**Remember, Understand, Apply, Analyse]**

COs (**STA-HC-4026**) mapped to POs & PSOs

After the completion of this course the students will be able to :

- Understand the Basic concepts of linear models along with Theory and estimation of linear models . (Understand)
- Acquire knowledge on Gauss Markov Theorem ,uses and fitting of these models, derivation of confidence interval, testing the hypothesis and interpretation of results. (Evaluate)
- Acquire knowledge on Simple and multiple linear regression models and their applications (Analsysis)
- Understand the Distribution of Quadratic Forms. (Remember)

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HC-4026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	L	L	M			
CO 2	H	H	L	L			
CO 3	L	H	L	M			
CO 4	L	L	M	H			
CO 5							

After the completion of this course the students will be able to :

- Understand the Basic concepts of linear models along with Theory and estimation of linear models . (Understand)
- Acquire knowledge on Gauss Markov Theorem ,uses and fitting of these models, derivation of confidence interval, testing the hypothesis and interpretation of results. (Evaluate)
- Acquire knowledge on Simple and multiple linear regression models and their applications (Analysis)
- Understand the Distribution of Quadratic Forms. (Remember)
- Know the Techniques of analysis of variance and covariance for fixed effect models. (Analysis)

Unit I: Gauss-Markov Set-up.
Unit II: Regression Analysis.
Unit III: Analysis of Variance.
Unit IV: Model Checking.

COs (**STA-HC-4036**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on statistical quality control, Seven tools of SPC, Process control, product control, Control charts for variable and attributes,ISO quality control, Quality hall of fames and quality gurus, Rational sub group, estimation of process capability.[**Understand**]
- Know about X bar chart, r cahrt, p chart, c chart, 3- sigma control chart and limits.[**Remember]**
- Know about acceptance of sampling plan, single and double sampling plan, consumer risk, producer risk, ASN, AOQL, AOQ.[**Understand]**
- Derivation on OC curve for Single sampling and double sampling paln.[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4

CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS
STA-HC-4036

	Unit I	**Unit II**	**Unit III**	**Unit IV**	**Unit V**	**Unit VI**	**Unit VII**
CO 1	**H**	**M**					
CO 2		**H**					
CO 3			**M**	**M**			
CO 4			**H**	**H**			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on statistical quality control, Seven tools of SPC, Process control, product control, Control charts for variable and attributes,ISO quality control, Quality hall of fames and quality gurus, Rational sub group, estimation of process capability.[**Understand**]
- Know about X bar chart, r cahrt, p chart, c chart, 3- sigma control chart and limits.[**Remember]**
- Know about acceptance of sampling plan, single and double sampling plan, consumer risk, producer risk, ASN, AOQL, AOQ.[**Understand]**

- Derivation on OC curve for Single sampling and double sampling paln.[**Analyse]**

Unit I: Statistical process control
Unit II:control chart for variable
Unit III: acceptance sampling plan
Unit IV: six sigma

COs (**STA-SE-4014**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on R programming language . Learn about how to load data and plot a graph, box plot, pie chart, ogives with graphical summaries of data. [**Analyse]**

- Acquire the knowledge of Report generation.[**Understand]**

- Have Knowledge on generation of random numbers and sampling procedures, fitting of polynomials and exponential curves etc. [**Analyse]**

- Learn basics of statistical inference in order to understand hypothesis testing and compute p values and confidence intervals. .[**Remember]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-SE-4014

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					
CO 2		H					
CO 3			M	M			
CO 4			H	H			
CO 5							

After the completion of this course, the students will be able to :

- Acquire knowledge on R programming language . Learn about how to load data and plot a graph, box plot, pie chart, ogives with graphical summaries of data . [**Analyse]**

- Acquire the knowledge of Report generation.[**Understand]**

- Have Knowledge on generation of random numbers and sampling procedures, fitting of polynomials and exponential curves etc. [**Analyse]**

- Learn basics of statistical inference in order to understand hypothesis testing and compute p values and confidence intervals. .[**Remember]**

Unit I: Plotting Graphs
Unit II: Report generation.
Unit III: Generation of Random numbers.
Unit IV: Statistical Analysis

COs **(STA-HG-4016**) mapped to Pos & PSOs

After the completion of this course, the students will be able to:

- Get the knowledge about Time series, Components of time series, Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares, Measurement of seasonal variations by method of ratio to trend. [**Analyse]**

- Acquire the knowledge of Index Numbers, construction of index numbers of prices and quantities, Consumer price index number etc. [**Analyse]**

- Have knowledge on Statistical Quality control, determination of tolerance limits, Chance and Assignable causes, Theories of control charts, process and product control, Control charts for variables: X-bar and R-charts, Control charts for attributes: p and c-charts. [**Analyse]**

- Study about Demographic methods, Measurement of mortality, Life tables, Measurement of Fertility and Reproduction, Measurement of population growth etc. [**Remember]**

- Acquire the knowledge of Demand analysis, Elasticity of demand, determination of elasticity of demand by family budget method, Lorentz curve, Engel's la and curve, Pareto's law of income distribution. [**Understand]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M

CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HG-4016

	Unit I	**Unit II**	**Unit III**	**Unit IV**	**Unit V**	**Unit VI**	**Unit VII**
CO 1	**H**	**M**					
CO 2		**H**					
CO 3			**M**	**M**			
CO 4			**H**	**H**			
CO 5							

After the completion of this course, the students will be able to:

- Get the knowledge about Time series, Components of time series, Measurement of trend by method of free-hand curve, method of semi-averages and method of least squares, Measurement of seasonal variations by method of ratio to trend. [**Analyse]**

- Acquire the knowledge of Index Numbers, construction of index numbers of prices and quantities, Consumer price index number etc. [**Analyse]**

- Have knowledge on Statistical Quality control, determination of tolerance limits, Chance and Assignable causes, Theories of control charts, process and product control, Control charts for variables: X-bar and R-charts, Control charts for attributes: p and c-charts. [**Analyse]**

- Study about Demographic methods, Measurement of mortality, Life tables, Measurement of Fertility and Reproduction, Measurement of population growth etc. [**Remember]**

- Acquire the knowledge of Demand analysis, Elasticity of demand, determination of elasticity of demand by family budget method, Lorentz curve, Engel's la and curve, Pareto's law of income distribution. [**Understand]**

Unit I: Time Series.
Unit II: Index Numbers.
Unit III: Statistical Quality Control.
Unit IV: Demography.
Unit V: Demand Analysis.

After the completion of this course, the students will be able to:

- Acquire knowledge on R programming language . Learn about how to load data and plot a graph, box plot, pie chart, ogives with graphical summaries of data. [**Analyse]**
- Acquire the knowledge of Report generation.[**Understand]**

- Have Knowledge on generation of random numbers and sampling procedures, fitting of polynomials and exponential curves etc. [**Analyse]**

- Learn basics of statistical inference in order to understand hypothesis testing and compute p values and confidence intervals. .[**Remember]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

STA-HC-5016

After the completion of this course the students will be able to:

- Get an idea about bivariate distributios, stochastic process amd stationary process. [**Remember, Understand, Apply, Analyse, Evaluate]**
- Understand Markov Chain, transition probability, stochastic matrix. Have knowledge on queuing theory [**Remember, Understand, Apply, Analyse, Evaluate**]

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-5016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M	M	M			
CO 2	M	H	M	M			
CO 3	H	H	H	M			
CO 4	H	H	H	H			
CO 5							

Unit I: Probability Distributions.

Unit II: Markov Chains.

Unit III:Poisson Process.

Unit IV:Queuing System.

STA-HC-5026

After the completion of this course the students will be able to:

- Have basic knowledge of different operators in C programming, loops and Arrays used in C programming [**Understand, Apply, Analyse, Create**]

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5 C06						H	M	M	M	H

Units/Topics Mapped to COS

STA-HC-5026

	Unit I	Unit II	Unit III	Unit IV	Uni t V	Unit VI	Unit VII
CO 1							
CO 2	M	H					
CO 3	H	H					
CO 4	H	H					
CO 5 C06	H	H					

Unit I: C Programming.

Unit II: Decision making and Arrays.

After the completion of this course the students will be able to:

- Have basic knowledge of different operators in C programming, loops and Arrays used in C programming [**Understand, Apply, Analyse, Create**]

COs (**STA-HE-5016**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Know the basics of Operation research and various phases of operation research. (Remember)
- To formulate the LPP and solve the same by using Graphical, Simplex and artificial variable techniques.(Apply)
- Understand the basic concept of game theory and its various problem. (Understand)
- Acquire knowledge on Practical exposure to the problems in operations research by using TORA. (Apply)

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HE-5016

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M	H				
CO 2	H	H	L				
CO 3	L		H	M			
CO 4	H		H	H			

CO 5							

After the completion of this course, the students will be able to:

- Know the basics of Operation research and various phases of operation research.(Remember)
- To formulate the LPP and solve the same by using Graphical, Simplex and artificial variable techniques. (Apply)
- Understand the basic concept of game theory and its various problem. (Understand)
- Acquire knowledge on Practical exposure to the problems in operations research by using TORA. (Apply)

Unit I: Operations Research
Unit III: Game Theory
Unit II: Transportation Problem
Unit IV:Inventory Management

COs (**STA-HE-5026**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Know the meaning and application of Time series[Remember,Understood]
- Have knowledge on various forecasting method.[Analyse,Evaluate]

Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H

CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS
STA-HE-5026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	**H**	**M**	**H**				
CO 2	**H**	H	**L**				
CO 3	**L**		**H**	**M**			
CO 4	**H**		**H**	**H**			
CO 5							

After the completion of this course the students will be able to:

- Know the meaning and application of Time series[Remember,Understood]
- Have knowledge on various forecasting method.[Analyse,Evaluate]

COs (**STA-HC-6016**) mapped to POs & PSOs

After the completion of this course the students will be able to:

- Understand the concept of ANOVA and will be able to apply ANOVA one way and two way to real life applications. (Understand)
- Set null and alternative hypothesis to one way and two way ANOVA, expectations of various sum of squares and calculating missing observations. (Evaluate)
- Gain knowledge on basic principles of Designs of experiments: CRD, RBD and LSD. (Evaluate)
- Understand factorial experiments and their application in various fields. (Understand)

Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**

CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS
STA-HC-6016

	Unit I	**Unit II**	**Unit III**	**Unit IV**	**Unit V**	**Unit VI**	**Unit VII**
CO 1	**H**	**H**	**H**				
CO 2	**H**	**H**	**M**				
CO 3	**H**	**L**	**L**				
CO 4	**L**	**L**	**H**				
CO 5							

After the completion of this course the students will be able to:

- Understand the concept of ANOVA and will be able to apply ANOVA one way and two way to real life applications. (Understand)
- Set null and alternative hypothesis to one way and two way ANOVA, expectations of various sum of squares and calculating missing observations. (Evaluate)
- Gain knowledge on basic principles of Designs of experiments: CRD, RBD and LSD. (Evaluate)
- Understand factorial experiments and their application in various fields. (Understand)

Unit I: Design of Experiments
Unit II: Design of Experiments
Unit III: Factorial Experiments

STA-HC-6026

After the completion of this course the students will be able to:

- Understand different types of non parametric tests and their applications. [**Understand,Apply,Analyse,Evaluate**]
- Understand bivariate and multivariate normal distributions along with their properties and applications[**Remember, Understand, Apply, Analyse, Evaluate**]

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	M	M	H	H	H	H
CO4	M	M	L	M	L	M	H	H	H	H
CO5										

Units/Topics Mapped to COS

STA-HC-6026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M	M				
CO 2	M	H	M				
CO 3	H	H	H				
CO 4	H	H	H				

Unit I: Bivariate and Multivariate Distributions.

Unit II: Multivariate Normal Distributions.

Unit III: Non-parametric Tests.

After the completion of this course the students will be able to:

- Understand different types of non parametric tests and their applications. [**Understand,Analyse**]
- Understand bivariate and multivariate normal distributions along with their properties and applications[**Remember, Understand, Apply, Analyse, Evaluate**]

COs (**STA-HE-6026**) mapped to POs & PSOs

After the completion of this course, the students will be able to:

- Acquire knowledge on population theory, measurement of mortality, measurements of fertility.[**Understand**]
- Know about vital statistics, method of obtaining vital statistics, rate and ratio of vital events[**Remember]**
- Know about life table, assumption of life table, uses of life tables, force of mortality, central mortality rate, GRR,NRR.[**Understand]**

- Derivation on force of mortality and central moratlity rate, measurement of population growth.[**Analyse]**

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	H	M		L	L	L	H	M	M	M
CO2	H	M		L	L	M	H	H	M	M
CO3	H	M		L	L	M	H	H	H	H
CO4		M	L	M	L	M	H	H	H	H
CO5		M		M	L	H	H	H	H	M

Units/Topics Mapped to COS

STA-HE-6026

	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Unit VII
CO 1	H	M					

CO 2		**H**					
CO 3			**M**	**M**			
CO 4			**H**	**H**			
CO 5							

After the completion of this course, the students will be able to:

- Acquire knowledge on population theory, measurement of mortality, measurements of fertility.[**Understand**]
- Know about vital statistics, method of obtaining vital statistics, rate and ratio of vital events[**Remember]**
- Know about life table, assumption of life table, uses of life tables, force of mortality, central mortality rate, GRR,NRR.[**Understand]**

- Derivation on force of mortality and central moratlity rate, measurement of population growth.[**Analyse]**

Unit I: Population theory
Unit II:Measurement of Mortality
Unit III: Life table
Unit IV: Measurement of Fertility

Units/Topics Mapped to COS
STA-HE-6046

Course Mapped to POS and COS

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
STA-HC-1016	M	M			H	H	H	H	M	M
STA-HC-1026	H	M		L	M	M	H	H	H	M
STA-HG-1016	H	M		L	M	M	H	H	H	M

STA-HC-2016	H	M		L	L	M	H	H	H	H
STA-HC-2026	H	M			M	M	H	H	H	H
STA-HG-2016	H	M		L	L	M	H	H	H	H
STA-HC-3016	M	M			H	H	H	H	M	M
STA-HC-3026	H	M		M	L	M	H	H	H	M
STA-HC-3036	H	M			H	M	H	H	H	H
STA-HG-3016	H	M		M	L	M	H	H	H	M
STA-SE-3014	H	M			H	M	H	H	H	H
STA-HC-4016	M	M			H	H	H	H	M	M
STA-HC-4026	H	M			M	M	H	H	H	H
STA-HC-4036	H	M			H	M	H	H	H	H
STA-HG-4016	H	M			M	M	H	H	H	H
STA-SE-4014	L	H			H	H	L	H	L	H
STA-HC-5016	H	M			H	M	H	H	H	H
STA-HC-5026	H	M		L	H	M	H	H	H	H
STA-HE-5016	H	M			H	M	H	H	H	H
STA-HE-5026	H	M			H	M	H	H	H	
STA-HC-6016	H	M			H	M	H	H	H	M
STA-HC-6026	H	M			H	M	H	H	H	H
STA-HE-6016	M	M				H	H	H	M	M
STA-HE-6046	M	M				H	H	H	H	H